

## City of Columbus

### Supplemental Specification 1505 High Recycled Asphalt Pavement Content

Supplemental Specification 1505 appends the following sections of the City of Columbus, Construction and Material Specifications to provide for the incorporation of Recycled Asphalt Pavement materials exceeding twenty-five percent (25%) in Type I Surface, forty percent (40%) in Type II Intermediate and fifty-five percent (55%) in 301 Base in the job mix formulas for City of Columbus projects where this Supplemental Specification is provided.

Related sections:

401.02 Mix Design and Quality Control

401.03 Materials

401.04 Reclaimed Asphalt Pavement

401.10 Mixing

403.05 Quality Control Tests

#### Section 401.02 Materials

Section 401.02 Mix Design is amended as follows:

#### **Mix Design: The following items are to be completed and provided with proposed Mix Design for Method 3 – High RAP JMF for approval by COC**

- Utilize Balanced Mix Design
- RAP Grading
  - Existing Binder Content – The existing binder percentage is used to determine the virgin binder requirements base off the JMF binder content target.
  - RAP Gradation – Fractionate RAP to conform to gradation for asphalt mixture, refer to table 441.02-1 or 442.02-2 accordingly. See RAP QC requirements for additional information.
  - Existing Binder Quality – Extracted PG (AASHTO M320) less than or equal to PG100-10
- Mix Design and Performance Testing
  - JMF extracted binder PG (AASHTO M320) meet or exceed PG 64-16 or the performance grade as specified in the contract documents
    - JMF binder is comprised of RAP binder, Virgin binder and Rejuvenating agent.
  - IDEAL-CT (ASTM D8225) >120 CT Index
  - DCT (ASTM D7313) at -12C >350 J/m<sup>2</sup>
  - Hamburg Wheel Tracking (AASHTO T-324) <12.5mm @ 10,000 cycles at 50C
  - Perform a TSR test following Ohio Department of Transportation Supplement 1051 with a minimum TSR of 0.70. If antistrip agents are needed, provide a minimum TSR of 0.80. Follow guidance for antistrip agents in 441.04.

#### Section 401.03 Materials

Section 401.03 Materials is amended as follows:

401.03 Asphalt Concrete Rejuvenating Agent.

Asphalt Concrete Rejuvenating Agent used for Method 3 – High Rap shall be approved for use by the City. Do not use wax-based recycling agents. The contractor shall submit supporting documentation for the City to evaluate the proposed asphalt concrete rejuvenating agent to be used in the proposed JMF. Rejuvenator Specifications

- (certificate of conformance to be provided with mix design)

Rejuvenator Properties	Specification
Homogeneity (Storage Stability)	Stable, Homogenous
Specific Gravity @ 25 °C, g/ml (ASTM D70)	0.90-1.10 (Asphalt ±10%)
Flash Point °C, Open Cup (ASTM D93)	Min 240°C (as in Asphalt)
RTFO Aging Viscosity Ratio* (ASTM D2872)	Max 3.0 (Similar to asphalt)
RTFO Mass Loss (ASTM D2872)	<1.0% (as in asphalt)
PAV at 100°C Aging Viscosity Ratio% (ASTM D6521)	Max 3.0 (to be verified)
Saturates, wt. % (ASTM D2007 or IP469**)	Max 30.0%
Asphaltenes, wt. % (ASTM D3279)	Max 1.0%

\*  $ViscosityRatio = \frac{Viscosity\ of\ Aged\ Residue\ from\ RTFO\ or\ PAV\ Test\ at\ 60^{\circ}C\ [140^{\circ}F]}{Original\ unaged\ Viscosity\ at\ 60^{\circ}C\ [140^{\circ}F]}$

\*\*IP-469 using the Iatroscan and a 60 minute N-Pentane elution performed as alternative to ASTM D2007. Results are deemed comparable within the context of specification requirements.

**Section 401.04:**

Section 401.04 Reclaimed Asphalt Pavement is amended as follows:

**401.04 C: Method 3 – High RAP**

Include RAP in the JMF submittal according to the High RAP Limits Table 401.04-3 unless specified differently in the applicable mix specification. Material under Method 3 shall be produced from a High Recycle Technology (HRT) plant, or a conventional plant that has been updated such that the production is controlled and regulated in a manner similar to that of a HRT Plant

A HRT plant is comprised of a batch tower to heat, dry and reclassify the virgin aggregate and a gravimetrically fed continuous parallel flow dryer to heat and dry the recycling aggregate materials. These materials will be weighed after they are heated and dry and combined in a mixer, to assure a homogenous production of asphalt.

Table 401.04-3 Method 3 – High RAP Limits

Asphalt Mix Application	Recent RAP by Dry Weight of Mix, (Max)	Total Virgin Asphalt Binder Content, Min	Rejuvenating Agent	Comments
442 Polymer Surface Course	60%	3.0%	Required – City Approved	
441 Surface Course	60%	3.0%	Required – City Approved	

441, 442 intermediate Course	60%	2.2%	Required – City Approved	
301 Base Course	60%	2%	Required – City Approved	
302 Base Course	60%	1.5%	Required – City Approved	

RAP QC Management Requirements.

Include in the QCP methods to be used to meet Method 3 requirements and the following: The contractor shall include information about the QCP as part of the JMF submittal.

1. Provide a meter system for recycling agent that conforms to Ohio Department of Transportation, Supplement 1053 Method A.
2. Provide enough space for meeting all RAP handling requirements at asphalt mix facility.
3. Provide a clean, graded base for stockpiles that does not collect water.
4. Test blended RAP stockpiles to assure uniform gradation and proposed JMF asphalt binder content.
5. Ensure uniform stockpile properties match the JMF submitted RAP properties.
  - a. Uniformity refers to a binder content of +/- .5% of that specified in the JMF.
6. RAP must be fractionated
  - i. Less than or equal to 5mm
  - ii. 5mm to 12.5mm
  - iii. 12.5mm to 25mm

Maintain in the plant lab and control room an up to date site map of all tested and untested RAP stockpiles. Give each stockpile a unique identification. Provide in the plant lab RAP properties for each fractionated stockpile cross referenced with its identification.

Stockpiles and processing methods are subject to inspection and approval by the Engineer at any time. Rejection of stockpiles can occur for the presence of foreign or deleterious materials, lack of uniformity, incomplete mixing in the asphalt mixture, or moving RAP in a way not traceable through the QCP records and methods. The Laboratory will resolve disputes over acceptability of RAP.

Section 401.10:

Section 401.10 Mixing is amended as follows:

401.10.1 Plant Aggregate Temperature Control Measures

- Virgin aggregate production temperature cannot exceed 550 degrees Fahrenheit
- RAP shall be pre-heated separately and excess moisture removed prior to incorporation into mix.

#### 403.05 Quality Control Tests:

##### Additional Mix and Production requirements for Method 3 – High RAP

- Material Production QC/QA Testing
  - One RAP extraction and AC gradation every day of production or when RAP stockpile or material uniformity changes.
    - Uniformity refers to a binder content of +/- ½% of that specified in the JMF.
  - Every 3,000 tons IDEAL-CT (ASTM D8225) >120CT Index
  - Every 6,000 tons Hamburg Wheel Tracking (AASHTO T-324) <12.5mm @ 10,000 cycles at 50C
  - For smaller production quantities (plan quantities between 750 and 7,000 tons) a minimum of the following tests will be required.
    - IDEAL-CT (ASTM D8225) >120 CT Index
    - Hamburg Wheel Tracking (AASHTO T-324) <12.5mm @ 10,000 cycles at 50C
      - To be provided with submission for approval of JMF for the current year